3.1 CROP PRODUCTION

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RATIONALE

A diploma holder in Agricultural Technology needs to learn about package of practices for various seasonal crops besides becoming familiar with the preparation of cost estimates for production of these crops. After studying the subject of crop production, the diploma holders should acquire adequate knowledge and skills of crop production and cropping system, soil fertility and weed management besides plant protection and crop harvesting. Hence this subject.

DETAILED CONTENTS

1. Introduction (15 hrs)

   Agriculture, importance of agriculture, Crop production Art, Science and business, Factors affecting crop production viz. Internal and external factors. Classification of crops based on their utility and seasons of growing. Major and principal crops of the country and Haryana state. Introduction to major fruits, vegetables and flower crops of country with specific emphasis on the crops of state of Haryana.

2. Crop Rotation and Cropping System (10 hrs)

   Crop rotation, Principles of crop rotation, advantages of crop rotation and rotational intensity. Cropping scheme and principles of cropping scheme. Cropping intensity. Systems of cropping viz. mixed cropping and intensive cropping. Principles of mixed cropping and its advantages. Pre-requisites of intensive cropping and methods of intensive cropping viz. multiple & intercropping. Crop diversification.

3. Seed Bed Preparation (5 hrs)

   Tillage, definition, function and importance of tillage. Types and methods of tillage. Effect of tillage on the soil characteristics and nutrient availability in soil. Selection of tillage methods.

4. Sowing / Placement of Seeds (5 hrs)

   Characteristics of good seed, types of seeds viz. Breeder's, Nucleus, and Foundation and Certified seeds. Seed treatment. Factors affecting seed germination. Different methods of seed placement in the soil and selection criteria of methods. Time of sowing.

5. Irrigation and Water Application (5 hrs)

Importance of water for plants, necessity of water application. Critical stages (growth) of water application .Sources of irrigation water. Methods of irrigation (names only). Factors affecting selection of method viz. crop , soil , source of water .

6. Interculture and Weed Management (5 hrs)

Importance of intercultural operations in crop productions . Introduction with the methods, tools and equipment required for interculture. Weed , its characteristics, classification, useful and harmful effects. Medium of weed seed dispersal. Methods of weed control viz. mechanical, biological, agronomical (crop competition and rotation), firing and chemical.

7. Soil Fertility Management (7 hrs)

Plant nutrient elements, their classification viz. Macro, Secondary & Micro and their importance. Soil fertility, Types of Fertilizers and Manners used to maintain soil fertility. Methods of application, tips for safe storage and better handling of fertilizers. Amount and time/stages of fertilizer application, organic fertilizers and their advantage.

8. Plant Protection (5 hrs)

Various factors/agents causing damage to the crop viz. Pests, Diseases etc. Introduction with the ecofriendly pest- management practices and the chemicals used for control of diseases, bio-pesticides.

9. Harvesting (3 hrs)

Various methods of harvesting of different crops. Factors of harvesting viz. time of maturity, moisture contents, climates factors etc.

10. Practices/Cultivation Details/Modern Techniques (20 hrs)

Package of practices/cultivation details/important modern techniques for raising following crops: -

Wheat, Paddy, Maize, Bajra, Gram, Mustard, Groundnut, Cotton, Sugarcane and Potato grown in Haryana.

LIST OF PRACTICALS

1. Identification of crops and their seeds.
2. Identification of different types of fertilizers.
3. Identification of different crop weeds and methods of weed control.
4. Practices of fertilizer application.
5. Methods of seed bed preparation.
6. Estimation of yield of crops.
7. Visits to the mechanized/modernized farms of agricultural universities/center-state farms for the study of growth phases in various crops and to get the exposure of modern techniques being used for raising different crops.
8. To develop "Vermicompost".
9. Methods of sowing/planting.
10. Estimation of different entities required for crop production.

LIST OF BOOKS

1. A text book of Soil Engineering; New India Publishing House Delhi.
2. Cropping System Theory & Practice by Chatterjee; Oxford & IBH Publication Co.
3. Crop Production &Management by Y.B. Morachan; Oxford & IBH Publication Co.
4. Principles & Practices of Agronomy by S.S. Singh; Kalyani Publishers, New Delhi.
5. Manual of Irrigation Agronomy by Mishra and Ahmad Mall; Oxford & IBH Publication CO.

3.2 WATER RESOURCES ENGINEERING

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RATIONALE

This course is aimed to equip the learner with the knowledge and skills required for the optimum development of surface and underground water resources. The exploitation of ground water resources is on higher side as compared to the recharge of ground water. It will reduce the availability of water resources and lead to a critical stage. Therefore, optimization of water resources should be adopted and diploma holder in Agricultural Technology should have the knowledge of water resources engineering. Hence this subject.

DETAILED CONTENTS

1. Introduction (12 hrs)

Water resources and their importance. Hydrological cycle. Hydrologic equation and its components. Geohydrological and hydrological balance. Rainfall and its measurement. Factors affecting rainfall. Run off, factors affecting runoff. Estimation of runoff.

2. Well Hydraulics (10 hrs)

Ground water sources, types of water bearing formations(confined, unconfined aquifer etc.) aquifer characteristics influencing yield of wells. Determination of aquifer constant, specific capacity of wells. Different terms related to well hydraulic such as water tables, isobath, isobar lines , draw down. Recharge of ground water.

3. Open Wells and Tube Wells (10 hrs)

Types of wells, open wells, their design parameters and construction of an open well, tube wells, methods of drilling tube wells-rotary drilling, core drilling and percussion drilling. Well installation and well development-objectives and methods. Testing of tube well.

4. Conveyance of irrigation water (10 hrs)

Canals and their classification (brief description only), seepage from canals and field channels. Canal lining-various types. Their advantages and disadvantages.

Introduction to various water conveyance structures and their functions e.g. flumes, tunnels, inverted siphons, flexible tubing and gated pipes.

Open channels, their types, layout and design parameters.

Subsurface systems of water conveyance, their components, hydraulics and layout.

5. Measurement of Water (6 hrs)

Units of water measurement, direct and indirect methods of water measurement. Measurement of water in pipes and open channels.

LIST OF BOOKS

1. Irrigation Theory & Practice by A.M. Michael .

2. Soil & water Engineering Volume-II by ISAE; Jain brothers.

3. Irrigation & water Power Engineering by B.C.Punmia; Standerd Publisher Distributors, Nai Sarak, Delhi-110006.

4. Principle of Agricultural Engineering Volume-II by A.M. Michael & T.P.Ojha; Jain brothers.

5. Water Resource Engineering by Arora & Bhattacharya; Satya Parkashan Publishers.

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3.3 MACHINE DRAWING

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RATIONALE

Diploma Holders are required to read and interpret drawings. Therefore it is essential that they have competency in preparing drawings and sketches of various machine parts. Therefore this subject is essentially required.

DETAILED CONTENT

1. Introduction

- Limits and Fits: Limit system – tolerance, limits, deviation, allowance, basic size, design size. Tolerances-fundamental tolerances, fundamental deviation, method of placing limit dimensions.

  Fits: Clearance fit, transition fit, interference fit, hole basis system, shaft basis system, tolerance grades.
  Calculating values of clearance/interference, hole tolerance and, shaft tolerance with given basic size for common assemblies like H7/g6, H7/m6, H8/u7.

- Surface Roughness

  Introduction-actual profile, reference profile, datum profile, mean profile, peak-to-valley height, mean roughness index, surface roughness number.

  Use of machining symbols in production drawings, indication of surface roughness-indication of special surface roughness characteristics, indication of machining allowance, indication of surface roughness, symbols on drawings, method of indicating surface roughness on given components.

Indicating roughness on a component for: -

i) Surface to be obtained by any production method.
ii) Surface to be obtained without removal of material.

2. Shaft Couplings (2 sheets)

- Oldham coupling
- Universal coupling

3. Bearings (5 sheets)

- Bush bearing
- Foot step bearing
- Plummer block
- Self aligning bearing
- Brackets

4. Pipe Joints (5 sheets)

- Symbols for piping and layout plan of piping
- Flanged joint
- Socket and spigot joint
- Union joint
- Expansion pipe joint

5. I.C. engine parts (2 sheets)

- I.C. engine connecting rods
- I.C. engine pistons

6. Screw Jack (1 sheet)

RECOMMENDED BOOKS

1. Machine Drawing by P.S. Gill; S.K. Kataria and Sons, Delhi.
2. Machine Drawing by R.K. Dhawan; S. Chand and Company, Delhi.
3. Machine Drawing by R.B. Gupta; Satya Parkashan, New Delhi.
4. Machine Drawing by N.D. Bhatt; Charotar Publishing House.

Note:
1. The drawings should include dimensions with tolerances, wherever necessary, and material list according to B.I.S. specifications as per SP46: 1988.
2. 25% of the drawing sheets should be drawn using AutoCAD.

3.4 MANUFACTURING TECHNOLOGY - I

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RATIONALE

The knowledge of manufacturing techniques in the area of foundry, machine shop (fitting shop, lathe machines and shaping), inspection and gauging and in coating both on metallic and non-metallic is essential at the first stage for understanding technology. Hence the following topics are included.

DETAILED CONTENTS

1. Fitting (10 hrs)

   Fits, limits and tolerances and their applications, unilateral and bilateral tolelances, gauges, gauge tolerances, micrometer, vernier, height gauges, dial comparator, straight edge, surface plate. Metal cutting, metal shear, metal sawing, metal bending. Types of pipes, their materials and pipe standards. Types of pipe fittings and applications, pipe threads and thread cuttings.

2. Metallic and Non-metallic Coatings (6 hrs)

   Necessity of metallic and non-metallic coatings, principles and processes of electroplating, galvanizing, vacuumizing, metal spraying, painting and their applications, preparation of base materials. Uses of primers, paints and finish coatings, powder coating and its advantages.

3. Foundry (10 hrs)

   Introduction, types of patterns, pattern materials, cores and core boxes, core materials, preservation and storage of patterns,. Introduction to moulding, types of moulding sounds, types of moulds, preparation of cores, defects in moulds and their remedies, types of melting furnaces (pit furnace, tilting furnace, cupola, oil fired and induction furnaces), casting defects and their remedies.

4. Lathes (10 hrs)

   Introduction, types of lathes, specifications, description and functions of lathe parts, feed mechanism, drives and transmission, work holding devices, turning tools

   Lathe operations – plain turning, facing, centring, parting off, undercutting, taper turning, eccentric turning, drilling, reaming, thread cutting and knuling, speeds and feeds of cut.

Introduction to capstan and turret lathes, copying lathe and their attachments, difference between capstan and turret lathes and heads, tool holders and tool layout, tool geometry and use of throwaway tips, brazed tools and HSS tools.

5. Shaper (2 hrs)
Operation and mechanism

6. Inspection Instruments and Gauges (10 hrs)

Height gauge, depth gauge, bore gauge, slip gauge, sine bar, measurement of taper by use of slip gauges, limits, fits and tolerances, interchangeability, Go and Not-Go gauges, screw thread micrometer, thread gauge, radius gauge, dial gauge, and gear tooth vernier, hardness checking instruments, coating thickness checking instruments, surface finish checking instruments, Tallyrand with computerized display of readings.

LIST OF PRACTICALS

1. Fitting shop

Bench work and fittings; simple male-female fitting (fitting of pulley, bearings, gears on shafts), scraping, pipe fittings with leakproof joints, checking alignment and centre distance

2. Pattern making and foundry shop

- To prepare pattern of rectangular block, 'V' block, step pulley with core box, split pattern
- Preparation of open floor mould of solid pattern, cope drag mould using split pattern
- Visit to foundry to see castings of cast iron, steel, non-ferrous materials, hand moulding, machine moulding and melting furnaces. Induction heating and gas fixed furnaces

3. Lathes

- Introduction to turning machine and allied services like cutting tool grinding, general shop layout including maintenance, oils, tools and gauge stores.
- Different exercises in turning like plain turning, step-turning, facing, chamfering, knurling, parting off and thread cutting, use of compound slide and tailstock, tool grinding, selection of coolant and lubricants and speed and feeds. Use of safety goggles.

LIST OF BOOKS

1. Workshop Technology by BS Raghuwanshi, Dhanpat Rai & Sons, Delhi
2. Manufacturing Technology by M Adithan and Gupta, New Age International (P) Ltd., Delhi
3. Elements of Workshop Technology by SK Choudhary & Hazara, Asia Publishing House
4. Principles of Foundry Technology by Jain, Tata McGrawHill, New Delhi
5. Workshop Technology, Vol-I, II & III by Chapman, Standard Publishers Distributors, New Delhi

3.5 SOIL CONSERVATION

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RATIONALE

A diploma holder in Agricultural Technology needs to learn about the soil erosion, the factors affecting the erosion besides the soil erosion control practices. A course on soil conservation shall equip the students with the knowledge of the physical and chemical properties of soil, various agents of erosion and various methods of erosion control. Hence this subject.

DETAILED CONTENTS

1. Soil & Its Properties (3 hrs)

   An introduction to the soil as a natural body, definitions and functions of soil. Various constituents of soil and their importance. Soil as a medium of plant growth, major soils of India.

2. Properties of Soil in relation to plant growth (10 hrs)

   2.1 Physical Properties

   2.1.1. Soil separates; their physical nature and their classifications (I. S. S. S. & U. S. D. A.).

   2.1.2. Soil texture; definition and textural classification of soil (U. S. D. A.).

   2.1.3. Soil structure; definition, types and factors affecting soil structure. Bulk density and particle density of soils. Soil consistency. Porosity & void ratio. Degree of saturation.

   2.1.4. Soil moisture content (dry basis & wet basis). Method of soil moisture determination viz. gravimetric method.

   2.1.5. Retention of soil moisture; maximum retentive capacity, field capacity, permanent wilting percentage, hygroscopic coefficient.

   2.1.6. Soil moisture classifications i.e. physical & biological. Available water holding capacity of soil. Soil permeability; definition and importance.

   2.1.7. Darcy ‘s law, Coefficient of permeability. Infiltration & Infiltration rate. Soil air & aeration. Soil temperature. Soil tilth & its importance.

   2.2 Chemical Properties

   Soil reaction (pH), Electrical Conductivity(EC), cation exchange, Sodium adsorption ratio (SAR), Exchangeable sodium percentage (ESP), salt concentration in the soils.

3. Erosion (6 hrs)

Definition, Classification of erosion viz. Geological & accelerated. Agents causing erosion

3.1 Mechanics of Water Erosion

3.1.1 Raindrop erosion, Sheet erosion, Rill erosion, Gully erosion and principle of gully erosion and Classification of gullies. Stream channel erosion

3.1.2 Effects of water erosion, Factors affecting erosion by water.

3.2 Mechanics Of Wind Erosion

Processes of saltation, suspension, surface creep. Factors affecting erosion by wind.

4. Erosion Control (18 hrs)

4.1. Principles of erosion control

4.2. Agronomic and field practices to control erosion by wind & water i.e. Contour farming, strip cropping, tillage etc.

4.3. Terracing to control erosion by water. Types of terraces. Terrace design parameters and planning a terrace system. Bench terraces, types and design parameters.

4.4. Use of bunds to control erosion and design parameters of bunds. Contour bunding.

4.5. Vegetated water ways for the control of erosion.

4.6. Temporary structures for the control of gully erosion, their types and adaptability.

4.7. Permanent soil conservation structures viz. Drop spillway, Chute spillway, Drop inlet spillway for the control of erosion; their principles, adaptability, constructional features and material of construction.

4.8. Introduction to the farm ponds, earthen embankments and water harvesting in relation to soil and water conservation, soil conservation through tree and grass cultivation

4.9. Concept of ground water recharge, watershed management

5. Salt affected soils and their reclamation (5 hrs)

Saline, alkaline and acid soils, Reasons and factors of their formation. Effect of salinity, alkalinity and acidity on plant growth. Reclamation of these soils and their management.

6. Waterlogged soils and their drainage (22 hrs)

6.1 Water logging, causes of water logging and its effects. Drainage. Types of drainage systems viz. surface and subsurface drainage. Introduction to drainage investigation. Benefits of drainage. Drainage properties of soil. Drainage coefficient.

6.2 Surface drainage-functional components, types (random drain, parallel field drain, parallel open ditch and bedding system used in flat areas and cross slope ditch system used in sloping areas). Introduction to design criteria and design parameters of open ditches.

6.3 Benefits of subsurface drainage. Introduction to investigations for subsurface drainage, different method of subsurface drainage viz. tile drains, mole drains, drainage wells, deep open drains and combination of tile and opened drains.

Note: Field visits should be made to soil testing laboratories, soil conservation projects, water logged sites and related institutes/organisations for clarity of concepts

LIST OF BOOKS

1. Soil & Water Conservation Engineering by Glenni O.Schwav, Richard K. Frevert, Talcott W. Edminster, Kenneth K.Barnes; John Wiley & Sons New York

2. Manual of Soil & Water Conservation Practice by Gurmail Singh; Oxford & IBH Publication co.

3. Soil & Water Conservation Engineering by Suresh R.; Standard Publication

4. Principle of Agricultural Engineering Volume-II by A.M. Michael & T.P. Ojha; Jain brothers.

4.6 COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING

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RATIONALE

Today age is computer age. Most of our daily activities are being influenced by the use of computers. While in areas like science and technology, improvements cannot be achieved without computers. It has become necessary for each and everyone of us to have a basic knowledge of application of computers. PowerPoint is a feature packed presentation programme whereas access is database management systems. Programming is backbone for preparing various technological projects, which can be achieved by C^{++} language – most versatile one in today's scenario. This subject is being offered to acquaint the students about MS PowerPoint, MS Access and Programming using C^{++} language.

DETAILED CONTENT

1. **Computer Application Overview** (3 hrs)

- Commercial and business data processing applications
- Engineering computation

2. **MS PowerPoint** (15 hrs)

2.1 Introduction

- Elements of power point package- templates, wizards, views, color schemes
- Starting PowerPoint
- Exploring PowerPoint menus
- Starting a new slide
- Adding title, text and art
- Moving text area and resizing text box
- Starting a slide show
- Saving a presentation
- Printing slides
- Inserting and deleting slides
- Closing a presentation
- Exercise for making a presentation and slide show

2.2 Views

- PowerPoint views – slide view, outline view, slide sorter view, notes view, slide show view, slide setup
- Zoom in, zoom out
- Exercises on various views of presentation

2.3 Formatting and Enhancing text

- Formatting
- Changing format with a new layout
- Alignment of text and text spacing
- Enhancing text formatting – use of bullets, changing text font and size
- Selecting text style and color
- Applying design template
- Closing and applying the transition
- Spell checking
- To set header and footer
- Exercise on formatting text and applying design template.

2.4 Slide with graphs

- Creating a graph
- Adding graphic objects
- Adding clipart pictures
- Adding movies and sounds
- Adding multimedia to presentation
- Inserting excel worksheet or word table
- Exercise on inserting graphs, tables, movies and clipart.

3 **MS - Access** (16 hrs)

3.1 Introduction to Microsoft access

- Components of access

3.2 Table creating

- Starting access, creating tables, tool bars and views of tables
- Editing the design and contents of the table
- Creating relationship between tables
- Adding OLE objects to a table
- Use of import and export facility
- Exercise on table creating

3.3 Query Handling

- Creating a new query, use of criteria, expressions and operation
- Editing a query, print a query
- Exercise on creating and editing query

3.4 Form designing

- Introduction, creating a form, modify a form design, designing a form using design view.
- Sub – forms, printing the forms, exercise on form designing.

3.5 Report designing

- Creating a report, managing the different controls of the records, saving and printing the report, use of graphs in reports
- Exercise on report designing

4 Programming fundamentals (6 hrs)

- Algorithm, pseudo language, flow charts: advantages and disadvantages
- Decision table – type, advantages and disadvantages
- Structured programming: structuring the control flow, modular programming
- Exercise on making algorithm and flow charts.

5 **C^{++} programming** (24 hrs)

5.1 Fundamentals

- Introduction, oop, character set, C^{++} tokens, keywords, identifiers, constants, basic data type, declaration of variables, defining symbolic constants, assignment statement, comments in a programme, structure of C^{++} programme, output using COUT, output using CIN, manipulators.

5.2 Operators and Expressions

- Arithmetic operators, relational operators, logical operators, shorthand assignment operator, increment and decrement operators, conditional operators, bit wise operators, precedence in C^{++} operators, casting of data, standard mathematical functions.

5.3 Control structures

- IF statements, IF---ELSE statements, nested IF statements, switch statements, Go To statements, repetitive structures, while statements, do statement, for loop, break statement, continue statement, nested loops.

5.4 Programs

- Write a program to check if a number is even or odd.
- Write a program to find the smallest of 3 numbers.
- Write a program to find largest of 4 numbers
- Write a program to find the roots of quadratic equation.
- Write a program to find the sum of the first N natural numbers using a for - do loops.
- Write a program that reads in N numbers and finds the smallest number among them.
- Write a program to find the sum of squares of the digits of a number.

6. Demonstration on CNC machine.

RECOMMENDED BOOKS

1. MS Office 2000 for everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd.
2. MS Office 2000 by Steve Hill; BPB Publications.
3. Programming in C++ by B. Subharamanayam.
4. Programming in C by Abdul Khader; Ajanata Publications

3.7 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

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RATIONALE

The objective of the course is to impart basic knowledge and skills regarding electrical engineering, which diploma holders will come across in their professional life

DETAILED CONTENTS

1. Application and Advantage of Electricity (4 hrs)

   Difference between AC and DC, various applications of electricity, advantages of electrical enginergy over other types of energy

2. Basic Quantities of Electricity (4 hrs)

   Definition of voltages, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit

3. Electromagnetic Induction (4 hrs)

   Production of e.m.f., idea of a transformer and its working principle

4. Distribution System (8 hrs)

   Difference between high and low voltage distribution system, identification of three-phase wire, neutral wires and earth wire in a low voltage distribution system. Identification of voltages between phases and between one phase and neutral. Difference between three-phase and single-phase supply

5. Domestic Installation (7 hrs)

   Distinction between light and fan circuits and single phase power circuit, sub-circuits, various accessories and parts of electrical installation. Identification of wiring systems. Common safety measures and earthing

6. Electric Motor (9 hrs)

   Definition and various applications of single-phase and three-phase motors. Connection and starting of three-phase induction motors by star-delta starter. Changing direction of rotation of a given 3 phase induction motor

7. Electrical Safety (5 hrs)

Electrical shock and precautions against shock, treatment of electric shock, concept of fuses and their classification, selection and application, concept of earthing and various types of earthing, applications of MCBs and ELCBs

8. Basic Electronics (7 hrs)

Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications, transistor – PNP and NPN, their characteristics and uses, characteristics and application of a thyristor, characteristics and applications of servo motors.

LIST OF PRACTICAL

1. Connection of a three-phase motor and starter with fuses and reversing of direction of rotation

2. Connection of a single-phase induction motor with supply and reversing of its direction of rotation

3. Charging of a lead – acid battery

4. Troubleshooting in domestic wiring system

5. Connection and reading of an electric energy meter

6. Study of a distribution board for domestic installation

7. Use of ammeter, voltmeter, wattmeter, energy meter and multi-meter

8. Ohm's Law verification

9. Verification of law of resistance in series

10. Verification of law of resistance in parallel

11. Study of different types of fuses

12. Study of earthing pratices

RECOMMENDED BOOKS

1. Basic Electrical Engineering by PS Dhongal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electricity by BR Sharma; Satya Prakashan, New Delhi
4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi